# Balluino: High Altitude IOT Based Real Time Air Quality Management system using Balloon/Drone

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## Abstract

Internet of Things paradigm originates from the proliferation of intelligent devices that can sense, compute and communicate data streams in a ubiquitous information and communication network

Degradation of air quality in cities is the result of a complex interaction between natural and anthropogenic environmental conditions. With the increase in urbanization and industrialization and due to poor control on emissions and little use of catalytic converters, a great amount of particulate and toxic gases are produced. Air quality is extremely difficult for human beings to feel or sense**.**

•In this Paper we Present Balliuno High Altitude Drone/Balloon based open source Pollution monitoring Device. We Have integrated several sensor like Gas, Temperature, Humidity, Pressure, Altitude With popular Microcontroller and Logging Data on cloud and as well as logging on Sd card for Offline Analysis. This Research Project will Help us to Monitor and identify source of pollution using quadcopter and also level of various gases in that Region

## Introduction

•The environmental problems are growing rapidly. Air pollutants from cars, buses and trucks, particularly ground-level ozone and particulate matter can worsen respiratory diseases and trigger asthma attacks. Transportation can be responsible for more than 50 percent of carbon monoxide in the air. This carbon monoxide can play havoc on human health. The air pollution may lead to Chronic obstructive pulmonary disease (COPD) and escalates risk of cancer

•Internet of Things may become helpful in cities for monitoring air pollution. These contaminants may be classified as being either anthropogenic (Result from Human Activities) or caused by natural events (such as fire, eruption) or resulting by decomposition of organic compound regardless of their orgin

•Pollutants can be divided into two types they are primary pollutant and secondary pollutants

•**Primary pollutants**, such as carbon, nitrogen, sulfur, and halogen compounds. They are released directly into the atmosphere from sources, and have high health impacts.

•**Secondary pollutants** such as nitrogen dioxide, hydrogen peroxide, ozone, sulfate and nitrate aerosols. They are not directly emitted. These pollutants are formed by atmospheric chemical processes acting upon primary pollutants, and event other gaseous species (non pollutant) in the atmosphere. The environmental impact of the air pollutants is

•The CO2 levels in the environment are usually used as an indicator for air quality because CO2 levels change in measurable amounts as the air quality varies Most commercial air quality controls such as those implemented in some advanced HVAC systems are based on the CO2 levels. As CO2 is produced when people breathe, indoor CO2 levels are higher than outdoors, depending on the number of building occupants and the rate of air ventilation. According to The Engineering Toolbox, the effects of the increased CO2 levels on adults at good health can be summarized as below.

•**normal outdoor level:** 350-450ppm,
• **acceptable levels:** < 600ppm,
• **complaints of stiffness and odors**: 600-1000ppm,
• **ASHRAE and OSHA standards:** 1000ppm,
• **general drowsiness:** 1000-2500ppm,
• **adverse health effects expected:** 2500-5000ppm
• **maximum allowed concentration within an 8 hour working period**: 5000ppm.

## Proposed Solution

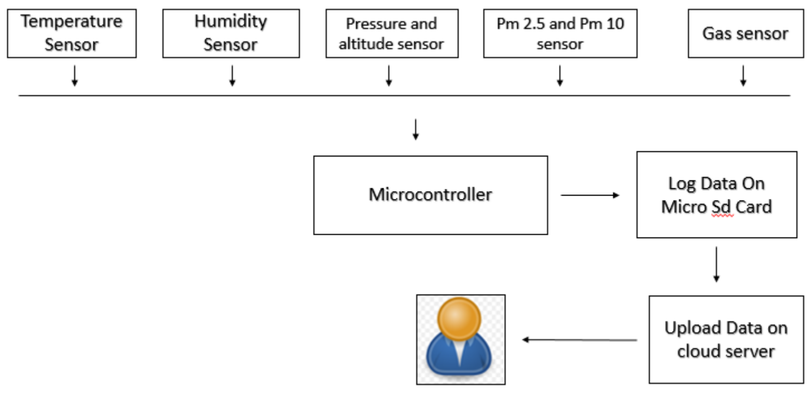
•We Made a hybrid system that can work with and without internet Efficiently when the drone is in the Air it shall send data to cloud server and we can monitor the Data Live Through application on smart phone. The data is also stored in form of csv file on a cloud server .In Case when Internet Fail the portable data logging will capture data in sd card later sd card can be inserted into computer and all data can be analyzed in form of Graph and Charts.

•We used Arduino Nano as portable Data logging system along with micro sd card reader to record samples and Internet based data logging we used Node mcu That's is ESP8266 along with all sensor to fetch Data to cloud server. We Decided to use Blynk since it is open source and features are explained in software part.

•We are monitoring Temperature, Humidity, Pressure, Altitude and few Atmospheric Gases Like Ammonia (NH3), Carbon mono oxide (CO), Nitrogen di oxide (NO2), Propane(C3H8), Hydrogen(H2), Butane (C4H10), Ethanol (C2H5OH), Methane (CH4).

•Based on result we plot the Graph of all gases and map pollution of particular Area using Drone or Balloons. These Result can Help will help us to know pollution of particular Area and Effective Measures can be adopted to control the pollution or else it might harm Human Health.

## Systems Block Diagram




## Results

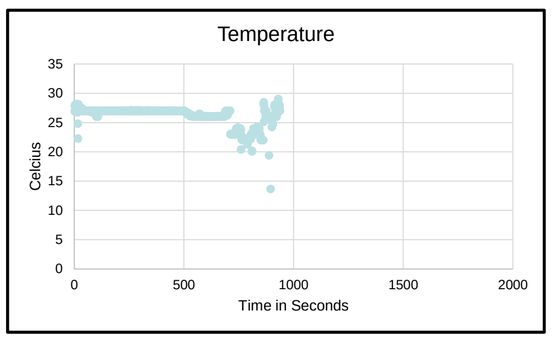



Figure Shows Temperature

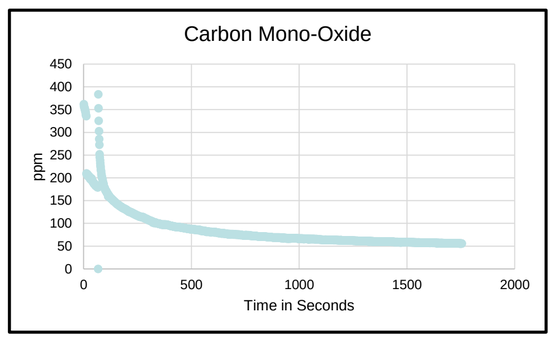



Figure Shows Carbon Mono oxide in PPM

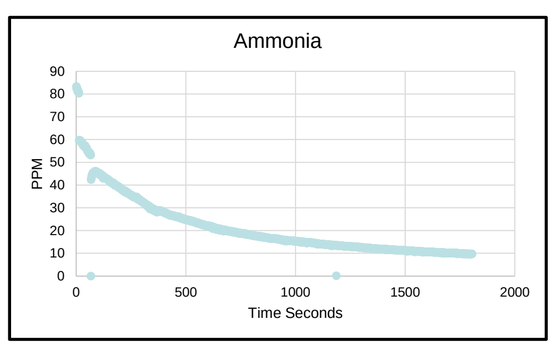



Figure Shows Level of Ammonia Gas in ppm

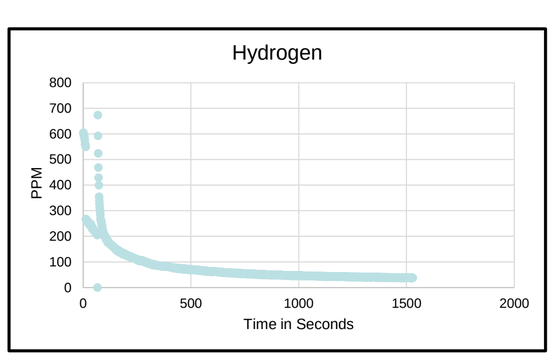



Figure Shows Level of Hydrogen Gas in ppm

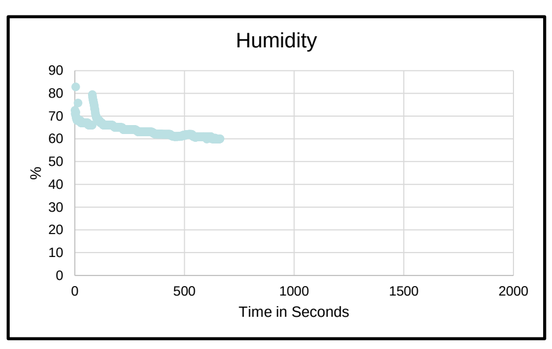



Figure Shows Level of Humidity

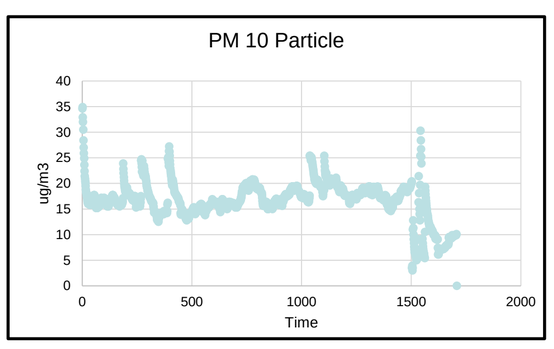



Figure Shows Level of Pm 10

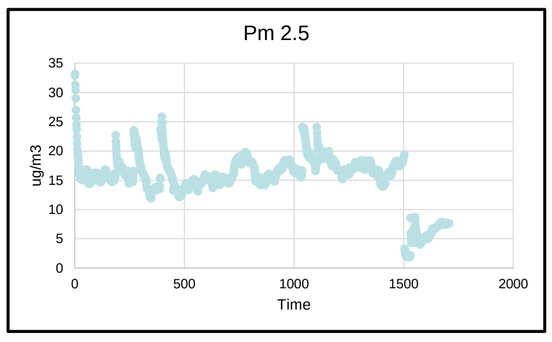



Figure Shows Level of Pm 2.5

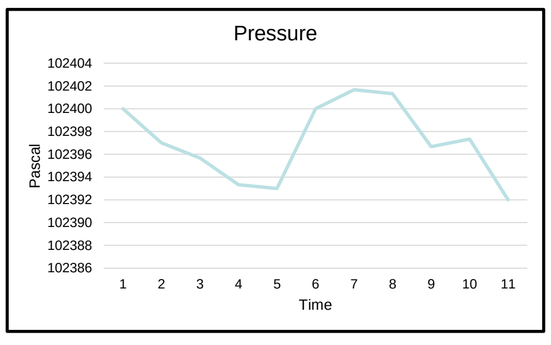



Figure Shows Pressure

## Implementation

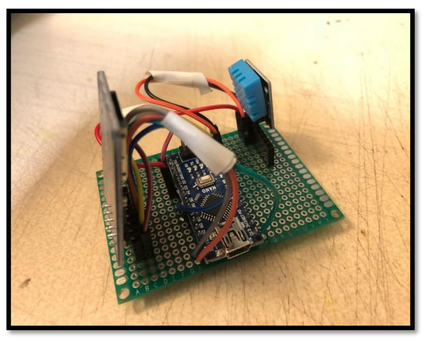


Figure Device to monitor Temperature and Humidity

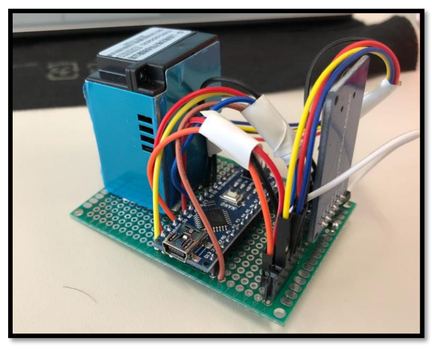


Figure Device to monitor Pm 2.5 and Pm 10 Particle

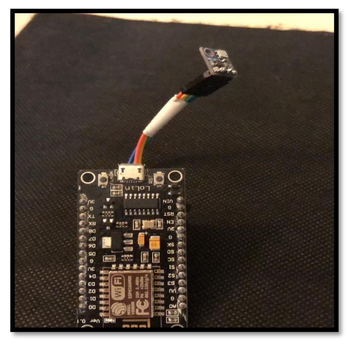


Figure Device to Monitor Pressure,Altitude

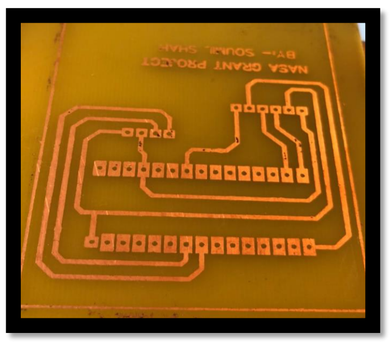


Figure shows Printed Circuit Board

Figure shows Drone Carrying payload

## Conclusion

Using High Altitude Balloon or Drone we measures several gases and several other Parameter like Temperature, Humidity , Pressure , Altitude , PM 2.5, PM 10 , Carbon Monoxide,Ammonia,Hydrogen .

These Gases will Help us to Plot Heat Map Which will tell from where these Pollution is Maximum and Based upon that Preventive Measure to control Future Work would include perform Machine learning to predict source of this pollution and enable drone to drone communication for efficiently Mapping PM 2.5 and Pm 10.